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HOW SOON IS NOW? THEORIZING TEMPORALITY IN INFORMATION SYSTEMS RESEARCH

Completed Research Paper

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Abstract

Time is an inherent quality of human life and the temporal nature of our being in this world has fundamentally shaped our knowledge and understanding of it: the concept of time pervades everyday language: “time is of the essence”; “timing is everything”; and “a stitch in time saves nine”. Thus, many disciplines are concerned with Time – physics of course, and also history, philosophy, psychology, computer science, communication studies and media. Nevertheless, our understanding of it is fundamentally limited because our consciousness moves along it. The goal of this paper is to develop a conceptualization of time that can be used to investigate the impact of temporality on the design, development, adoption and use of Information Systems and to trace the societal and business impact of that association.

Keywords: Key issues, theory building, time pressure, qualitative research
Introduction

Time is an inherent quality of human life (Hassard, 1999) and the temporal nature of our being in this world has fundamentally shaped our knowledge and understanding of it: the concept of time pervades everyday language: “time is of the essence”: “timing is everything”: something can be “just in time” and “a stitch in time saves nine”. Thus, many disciplines are concerned with Time – physics of course, and also history, biology, philosophy, psychology, computer science, mathematics, neuroscience, communication studies and media. Nevertheless, our understanding of it is fundamentally limited because our consciousness moves along it (Wells, 1895, p. 6). The goal of this paper is to develop a conceptualization of time that can be used to investigate the impact of temporality on the design, development, adoption and use of Information Systems and to trace the societal and business impact of that association. The paper begins by illustrating the importance of temporality for Information Systems Research and then explores the theoretical shortcomings of the research on temporality to date. The literature review and theory building processes are described. A theoretical framework of organizational temporality is developed using existing literature. The paper concludes with a discussion of future directions for IS research on organizational temporality.

The importance of temporality in Information Systems

There are many reasons why temporal factors should be of primary concern for Information Systems researchers (Saunders, 2007; Lee and Liebenau, 2000b). First, time is a fundamental business performance indicator (Ciborra, 1999). In the context of Information Systems development, project completion time has been used to evaluate project success more than fifty years (Atkinson, 1999; cf. Olsen, 1971). Such is the importance of time in organizations that in many cases, time delays are considered synonymous with project failure (Toxvaerd, 2006; Sarkar and Sahay, 2004).

In today's high velocity business environment (Eisenhardt, 1989; O Riordan et al., 2012b), organizations are also under increased pressure to work at speed. Much of this time pressure is attributable to the use of Information Systems in business. In the extreme, net-enabled firms are expected to operate in “real time” and activities must happen instantly (El Sawy and Majchrzak, 2004; Orlikowski and Yates, 2002). Yet even in traditional manufacturing industries, Information Systems have effectively been used to ‘compress’ time (Kumar, 1995). In the context of IS development, contemporary work practices, based on high-speed release cycles, are being used to reduce development time frames (Baskerville and Pries-Heje, 2004).

Finally, organizations frequently overlook the hidden costs associated with increased speed (Rämö, 2002; Merle Crawford, 1992); often failing to recognize that ‘faster’ is not always ‘better’ (Kessler and Bierly, 2002). At a high level, firms operating in an age of temporary advantage are forced to pursue strategies based on reduced time-to-market (D’Aveni et al., 2010; Cohen et al., 1996) and for many, competitive survival has become a question of delivering projects on time (Staats et al., 2012). At the micro level, these pressures have been shown to negatively affect behavior. For example, time pressure impairs decision-making (Marsden et al., 2002; Failla and Bagnara, 1992), alters risk evaluation (Kahneman, 2011; Das and Teng, 2001), causes stress (Maule and Svenson, 1993), inhibits creativity and motivation (Amabile et al., 2002; Baer and Oldham, 2006; O Riordan et al., 2011), reduces software quality (Austin, 2001) and negatively affects business negotiations (De Dreu, 2003).

For these reasons, there is a strong need from an IS perspective to be able to understand how technologies can and should be used in organizations in order to perceive, measure, manipulate and use time. Indeed, IS researchers have made repeated calls for research to investigate the impact of IS/IT on organizational temporality (Lee and Liebenau, 2000). In particular, there is a need to better understand how Information Systems can be used to develop richer visualizations of time and time-use in firms that go beyond the simplistic notion of linear time. At the same time, there is a need to understand how Information Systems might be used to eliminate rigidity in work rhythms (Lee and Liebenau, 2000) thereby increasing enterprise agility and also reducing the growing tension that exists between individuals’ temporal preferences and organizational temporal structures (Perlow, 1999). Nevertheless, there seems to be a stubborn paucity of research on temporality in Information Systems research (Nan
and Harter, 2009; Saunders, 2007; Lee and Liebenau, 2000).

**On the theoretical shortcomings of existing research**

Despite its importance, our understanding of organizational temporality and its relationship with technology is limited (Orlikowski and Yates, 2002; Saunders, 2007). Indeed, it is described as one of the most elusive concepts related to work (Sarkar and Sahay, 2004; Massey et al., 2003; Cooper and Rouseau, 2000). This section argues that the concept of time suffers from a number of significant theoretical shortcomings that hinder temporal studies.

**Lack of cumulative tradition:** A good concept or theory should cumulatively build on existing research (Dubin, 1978), but there is a lack of coherence in research on organizational temporality (Nandhakumar, 2002). As a result, we are in a wonderful age of discovery about temporal issues in organizations but with, unfortunately, little comparison and integration across studies. This lack of synthesis and coherence has resulted in a failure to resolve the abstract nature of time.

**Myopic measures of time:** Instead, researchers have rarely gone beyond measuring time-on-task or elapsed time (Saunders and Kim, 2007; Kavanagh and Araujo, 1995). Time has been narrowly conceived as a linear continuum of infinitely divisible, quantifiable units that are homogeneous, uniform, regular, precise, deterministic, and measurable (Ancona, et al., 2001a). Fundamentally, these measures “fail to capture the complexity of industrial temporality” (Hassard, 1999, p. 585). It is only by adopting a richer conceptual lens that researchers may begin to think about processes and practices in terms of how fast they are moving, their trajectories over time, the cycles they align with, and the historical positions they take on the continuum of time (Ancona et al., 2001b). This myopic use of narrow measures has cost IS researchers the opportunity to fully evaluate the temporal effects of new technologies in organizations and to use that information to design and manage IS/IT in firms (Lee and Liebenau, 2000a; Sahay, 1997; Failla and Bagnara, 1992).

**Lack of research on temporal construct associations:** As a construct or variable, time is fundamental to a variety of theories of organizational change and strategic planning, as well as numerous mid-range models such as the product life cycle (Kavanagh and Araujo, 1995). Yet because of the reliance on myopic measures of time, researchers rarely delve into the temporal dynamics of associations between constructs (Mitchell and James, 2001). Researchers do not generally report their results in terms of the duration of effects, the time lag between causes and effects, or differences in rates of change in their research (George and Jones, 2000, p. 670). Similarly, decisions about when to measure and how frequently to measure variables are left to intuition, chance, convenience, or tradition (Mitchell and James, 2001). In effect, researchers disregard the temporal complexities of theory and fail to adequately represent the temporal dynamics of theoretical relationships. As a result, researchers are forced to overlook the rhythms or patterns of relationships over time and must rely on “impoverished theory about issues such as when events occur, when they change, or how quickly they change” (Mitchell and James, 2001, p. 533).

To address these conceptual weaknesses in studies of time, the main aim of this research is to develop a conceptualization of time that can be used as a starting point to meaningfully evaluate temporality and its relationship with technology in firms. The paper leverages existing research on organizational temporality across multiple disciplines in order to fully specify the construct where variants and sub-components of the concept have originated, matured, and have been applied and tested thoroughly over time. The next section describes the approach taken to review the pertinent literature and build the model. The overarching conceptual framework of organizational temporality and its sub-components are then presented and discussed. The paper concludes with a discussion of the implications of the study and possible avenues for future research.
Research Approach

Approach to Literature Review

The concept of time transcends all research boundaries. It is as salient in physics as it is in psychology. Thus, the literature on time in organizations owes as much to research in philosophy and music as it does to research on project management and engineering. One of the core motivations for this research was to celebrate the diversity of ideas surrounding the notion of time that are all too often eliminated in IS research. Given that a methodological review of past literature is crucial for any academic research (Webster and Watson, 2002) and must be done rigorously and comprehensively (Walsham 2006), this section describes our approach for collecting and synthesizing literature.

According to Fink (2010), a rigorous stand-alone literature review should be systematic, explicit, comprehensive and reproducible by others. To achieve these goals, we followed a clear process. To ensure that the review was systematic, we clearly defined the purpose of the review (to build a new and holistic theory of organizational temporality) and devised a protocol for identifying and selecting literature. To ensure that the review was explicit, we recorded each step that was used to identify literature and also tracked the criteria that were used when screening the papers for inclusion and exclusion. To ensure that the review was comprehensive, we used two separate analyses: (1) we used Webster and Watson’s (2002) technique of scrutinizing works cited by and citing the literature we had already identified, and (2) we conducted a usage-based analysis using the bX™ Usage-Based Services. For each source, this software will generate a list of related articles based on other users’ previous search behaviors. This technique was particularly useful as it yielded several important articles about time in organizations that had been outside the bounds of our original search parameters. We were satisfied that the review had reached a stage of completion when our search activities failed to yield any additional articles. In order to ensure reproducibility, we stored and systematically organized all of the data concerning the identification, selection and classification of sources, including the decision making criteria that were used at each stage.

Approach to Theory Building

Taken together, conceptualization and construct measurement have the power to provide a better understanding and explanation of interesting and important phenomena (Barki, 2008). Thus, the aim of this study is to provide a rich definition and conceptualization of Time that can be used to meaningfully evaluate temporality in an organizational context. Our approach for developing a new conceptualization of time in organizations is informed by Dubin (1978). As such, we followed a three-phase process, with activities in each phase overlapping to some degree and the overall approach being iterative in nature.

The first phase was to identify temporal attributes, variables or dimensions that have already been used in research. As part of this process, several concepts that appeared to be identical or almost identical were grouped together. Perlow’s (1999) concept of temporal preference, for example, is not dissimilar to the concept to temporal style (cf. Bluedorn et al., 1999). The second phase was to systematically classify and arrange each concept: it is only when units of theory are put together into models of the perceived world that theories emerge (Dubin, 1978, p. 28). This initial classification was carried out with reference to the significance of individual concepts. That is to say, the design of the classification was informed by the relative importance of particular concepts in explaining organizational phenomena. For example, the classification places less emphasis on individual impulsiveness, for example, because this concept has been less frequently used to explain organizational phenomena. The third phase was essentially where the initial framework was subjected to what Campbell (1974) describes as ideational trial and error. Each element of the framework was scrutinized and tested for definitional accuracy so that conceptual ambiguities at the individual item level could be identified and removed. We then scrutinized the way in which we had classified each concept to ensure that each concept had been logically categorized. Finally, the interrelationships between individual concepts and between categories of concepts were scrutinized.
Theoretical Framework

At the highest level of abstraction, this framework indicates that organizational temporality is a multidimensional construct. That is to say, it is a holistic representation of a complex phenomenon and as such, is itself composed of a series of latent constructs (Polites et al., 2011). Several authors have attempted to delineate the main dimensions of temporality. However, few have made the explicit argument that all aspects of the construct must be considered if it is to be accurately represented; that is to say, that researchers must attempt to measure all of the latent construct that collectively measure it. Given the importance we attribute to this challenge, the identification of the key dimensions of organizational temporality was a core part of the theory building process. This section begins by describing the process that led to the identification of the three dimensions of organizational temporality in the framework and then presents each dimension in turn.

Identifying the key dimensions of organizational temporality

Over the course of the research, we evaluated three possible ways of classifying the dimensions of organizational temporality. The first is the classic approach of distinguishing between objective and subjective time. The second approach, somewhat similar to the first, distinguishes between enactments and construals of time. The third approach is primarily concerned with mind-dependent aspects of organizational temporality: it considers conceptions of time, actor relations with time and mapping of activities to time. The final approach, the one that informs the construction of this framework, effectively synthesizes each of these approaches and distinguishes between using time, thinking about time and relating to time.

The classic approach distinguishes between ‘objective’ (mind-independent) and ‘subjective’ (mind-dependent) time (e.g. Kavanagh and Araujo, 1995; Sahay, 1998; Bluedorn et al., 1999; Lee and Liebenau, 2000b; Orlikowski and Yates 2002). Mind-independent time is an objective, chronological (Sarkar and Sarkar, 2004) and material commodity that is scarce, valuable, homogenous, linear and divisible (Sahay, 1997). Mind-dependent time is neither objective nor chronological. Instead, time units are considered “heterogeneous, discontinuous, and unequal” (Starkey, 1989, p.42). Research on mind-dependent time focuses on mental representations of time - the knowledge schemata of individuals - in organizations (cf. Labianca et al., 2005). That is to say, it focuses on the multiple ways in which time is experienced and on the co-existence of multiple temporalities in the workplace (e.g. Nandhakumar, 2002, p. 257). As such, it emphasis ‘pluritemporalism’ in the workplace (Nowotny, 1992) and highlights the simultaneous existence of multiple “temporal zones” in the firm (Kavanagh and Araujo, 1995). The second is proposed by Ballard and Seibold’s (2003). In this model, temporality consists of two main dimensions: the enactments of time and the construals of time. Enactments of time include flexibility, linearity, pace, precision, scheduling, and separation. Construals of time consist of present time perspective, future time perspective, scarcity and urgency. In their model, these dimensions of time are thought to affect temporal experience. The third is proposed by Ancona et al (2001). This framework is composed of three categories of variables. Conceptions of time describe different ways of describing or characterizing time (e.g. clock time, cyclical time, event time). Mapping activities to time relates to how activities and events are mapped to time. This category is closely related to Ballard and Seibold’s (2003) framework as both deal with concepts like rate, duration and scheduling. Finally, actors relating to time describes how actors’ temporal perceptions and also actors’ temporal personalities. This is one of the only frameworks to explicitly argue that the subjective or mind-dependent dimension of time goes beyond perception alone: each individual has their own characteristic way of interacting with time and their own personal preferences about how they use time and this temporal style or personality influences how individuals perceive time. However, as the authors admit, the model is not readily amenable to direct empirical testing.

Each of these approaches has advantages and disadvantages. The distinction between objective and subjective time is well established and therefore well understood however it does not, in fact, reflect any inherent property of time (Orlikowski and Yates, 2002). In our initial attempts to categorize the constructs and variables in the literature, we had several key variables that could not easily be classified.
into either category. For instance, a number of the variables we identified related to temporal planning activities. When one uses a Gantt chart (a type of bar chart used to illustrate and plan project schedules), for example, it is not immediately obvious whether one is representing planned activities along the linear continuum of objective time or whether one is creating a mental representation, a subjective interpretation, of time. The distinction between enactments and construals bears some resemblance to the first view but provides a starting point for making a broad distinction between using time (a behavioral phenomenon) and relating to time (a cognitive phenomenon). The main difficulty we had with framework was that it was insufficiently broad in scope to incorporate all of the temporal variables we had identified in the literature. In particular, it omits temporal planning, where resources are first allocated for the completion of tasks). The significance of temporal planning is that it shapes subsequent time use and ultimately influences how people relate to time.

On the basis of this analysis, our theoretical framework identifies three main dimensions of organizational temporality (illustrated in Figure 1). The first dimension is temporal planning. Planning Time concerns those activities within the firm that pertain to the allocation of the firm’s resources. Temporal planning is a fundamental organizational process because it leads to the optimization of resource use. This dimension exists primarily within the realm of mind-dependent or subjective temporality but is specifically concerned with organizational actors’ intentions about time use. In this regard, it is akin to Sherman’s (2001) concept of thinking about time. The second dimension is Using Time. The dimension is conceptually similar to Ballard and Seibold’s (2003) concept of enactments of time but also different the different ways that people choose or prefer to use time (temporal style). Its importance is that it underlines the fact that organizational temporality arises out of human engagement in the world (Hörning et al., 1999). The final dimension is called Relating to Time. This dimension relates to both the myriad ways in which organizational actors conceptualize time but also encompasses preferences about time. In this regard, it is akin to Ancona’s (2001) distinction between conceptions of time and temporal personalities. The next section decomposes these three dimensions of organizational temporality into their constituent elements.
Deconstructing the three dimensions of organizational temporality

Planning Time (§1)

In organizations, planning is a fundamental process. It is a process of optimizing the allocation of resources in pursuit of value. Planning Time concerns those activities within the firm that pertain to the allocation of the firm’s resources. As indicated in Figure 2, the framework proposes that Planning Time is composed of two elements.

<table>
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<td>1. Planning style</td>
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<tr>
<td>(a) Planning philosophy or ethos</td>
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<td>(b) Level of forethought</td>
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<td>(c) Distance between planning and execution</td>
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<td>(d) Generosity of temporal allocations</td>
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<td>2. Temporal coordination</td>
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<td>(a) Exactitude</td>
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<td>(b) Flexibility</td>
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Figure 2. Planning Time (§1)

Planning style refers to the approach taken to planning a particular event. The significance of planning style is that it inevitably shapes subsequent evaluations of time use. We propose that planning style be evaluated using four indicators. The ethos or philosophical underpinning the approach to time and planning in the firm ultimately governs the amount of temporal freedom or autonomy that organizational actors may have (or not have). The need to consider the amount of forethought preceding an event is suggested by Scribe and Gutek (1987) who describe the salience of future orientation as an important characteristic of organizational temporal cultures. The temporal distance between the planning of an event and its execution gives an indication of the extent to which temporal planners are proactively or reactively in control of time within a firm. It also speaks to the overall flexibility of the organization in terms of rapidly responding to uncertainty and can be used to evaluate the impulsiveness of the firm. Finally, the need to consider the generosity of time allocated to events is suggested by existing literature on time boxing (cf. Martin, 1991) and other practices that decompose work into units of time. More so than investigating deadlines in their own right, it provides an indication of time scarcity in the firm (Scriber and Gutek, 1987) and sheds light on the creation of time pressure.

Temporal Coordination refers to the extent to which events are synchronized in the firm from a planning perspective. According to Malone et al., (1987), the primacy of organizations over markets comes down to the question of coordinating activity. Traditionally, coordination has been achieved through scheduling. Coordination can be scrutinized by considering the level of exactitude with which time use is planned and the level of flexibility that is incorporated into planned time use. Exactitude refers to the level of precision with which a particular event is planned in terms of time. The concept is based on the work of Raybeck (1992), who suggests that the level of temporal exactitude about previously planned deadlines decreases as the need for temporal flexibility increases. The significance of exactitude is that it speaks to the cultural attitudes within a particular firm with regard to time. For example, the rigidity with which deadlines are planned and subsequently adhered to within an organization represents an important insight into the temporal character of that firm. Research has shown that attention to time is a catalyst that motivates groups to pace work under deadlines (Waller et al., 2001). Flexibility refers to the extent to which the planning of a particular event can be adapted in response to changing needs. The concept of flexibility can
be evaluated by considering the degree of change required and the timeframe within which that change must be realized (Conboy, 2009). The main challenge for organizations today is to balance the need for coordination with the need for flexibility, taking into account that the optimal level of flexibility is likely to differ across industries and across different levels of the organizations. The level of contingency planning built into software development projects would be inappropriate for manufacturing contexts, for example, where higher levels of planning rigidity are better tolerated. Similarly, the techniques used to ensure flexibility have evolved over time. The idea of using temporal buffers so that plans could be re-specified 'on-the-fly' was written about in literature in the 1980s but was not observed in practice until much later (cf. Scriber and Gutek, 1987). In many cases, the increased use of Information and Communication technologies (ICTs) has facilitated more on-the-fly coordination. Thus, contemporary practices achieve temporal flexibility through temporal elasticity, rather than temporal exactitude.

Using Time (§2)

Just as Ballard and Seibold (2003) consider temporal enactments, our framework suggests that the temporal profile of a given event can be described by considering the execution of an event as well as its planning. Using Time therefore refers to the manner in which time is enacted or performed within the organization. As illustrated in Figure 3, the framework suggests that Using Time consists of two main elements.

**Using Time (§2)**

1. Execution style
   - (a) Improvisatory style
   - (b) Monochronicity
   - (c) Polychronicity
   - (d) Pace
2. Temporal position
   - (a) Absolute temporal position
   - (b) Relative temporal position
   - (c) Timeliness
   - (d) Temporal deviation

*Execution style* refers to the approach taken to actually executing an event. The concept is derived from existing literature on temporal structures (Orlikowski and Yates, 2002), temporal patterning (McGrath and Kelly, 1992), and temporal ordering (Zerubavel, 1979). This literature explicitly argues that temporal structures are enacted recurrently in everyday organizational practices (Orlikowski and Yates, 2002, p. 686). Execution style is a behavioral construct, intended to capture the lived experience of organizational temporality. Four aspects of execution style are identified. *Improvisatory style* refers to the extent to which activities are spontaneous or impromptu (cf. Crossan *et al.*, 2005; Weick, 1998). As argued by Ciborra (1999), improvisation in an organizational context has its own unique temporal character that differs from standard or routine modes of activity. *Monochronicity* describes the extent to which activities are executed serially (Hall, 1966). *Polychronicity* refers to the extent to which activities are executed simultaneously (Hall, 1966). Though few studies have investigated organizational polychronicity, its significance is suggested by the work of Souitaris and Maestro (2010), who demonstrate that polychronicity improves performance at senior management level at least. Finally, *Pace*, measured quantitatively, describes both the ratio between the amount of work to be completed and the time taken to complete it (cf. Wally and Baum, 1994). In this sense, pace gives an indication of the productivity of organizational actors from a temporal perspective and the amount of time compression that has already been brought about in a particular organization. This is important in terms of determining whether the
firm is already at or near optimal temporal performance for a particular event type. However, most research on organizational temporality concentrates on measures of speed at the detriment of acceleration. The concept of pace can also be extended to take into account the amount of change in pace within a particular event. Its pace may be steady and consistent or erratic and changeable; it may be accelerating or decelerating. Changes in pace can be accidental but are sometimes deliberate. To take a musical analogy, composers often pre-specify tempo markings that change according to the texture of a given musical passage (Albert and Bell, 2002). Indeed, composers will sometimes specify tempo rubato. The indication affords the performer(s) the discretion to modify the tempo of a piece in an expressive way. The term literally means “stolen time”. To take an example from software development, the concept of entrainment describes the process whereby teams either pace their change internally to coincide with the midpoint, deadline, or task phases, or externally by entraining to exogenous pacers (Ancona and Chong, 1996). But even when pace changes are deliberate, they are achieved at a cost. This point is well illustrated in extant research on lean manufacturing, which identifies temporal unevenness as an important – but overlooked - source of waste in organizations.

Temporal position is the second component of Using Time. It describes the location of a particular event in time. Traditionally, this position has been narrowly conceptualized in terms of calendars, timelines and Gantt charts. Our framework attempts a much broader conceptualization of temporal position. Specifically, it identifies four aspects of temporal position for individual events. Absolute temporal position is specified using traditional measures of temporal position: start time, end time and duration. Note that multiple start and end times may be recorded against a particular event if that event is interrupted, delayed or postponed. Relative temporal position describes the temporal position of an event in relation to other events. The practice of defining events’ temporal positions relatively is pervasive. In project management, for example, the practice of recouping lost time on a project by moving individual tasks from a serial temporal configuration to a parallel arrangement is well established. We propose that relative temporal position is given by considering whether a given event fundamentally occurs (i) serially or in parallel with other events, and (ii) whether the event is iterative or novel. It is also here that one may evaluate the extent to which pace or tempo changes are occurring within the firm (either within events that repeat or across groups of events, depending on the individual study). Timeliness measures extent to which an event occurs at the ‘right moment’ – kairos – and the extent to which it was given the right amount of time. When events occur in a timely fashion, delays and interruptions will be less common. In short, the firm will “run like clockwork”. Existing literature on timing in organizations is primarily focused on aspects of poor timing including sequence problems (Lieberman and Montgomery, 1988), synchrony problems (Perlow, 1999), rate problems (Eisenhardt, 1989), deadlines (Waller et al., 2001) and duration problems (Ancona et al., 2001). Finally, temporal deviation describes the difference between the planned temporal position of an event and the executed temporal position of an event. Where an event begins later than planned it is late. When its duration is less than planned, it is truncated, and so on.

Relating to Time (§3)

Relating to Time refer to individuals’ understanding and experience of time and deadlines (Labianca et al., 2005). It is through the interaction of organizational temporal structures and organizational agents’ perceptions of, and reactions to, time that temporality in organizations manifests. It is for this reason that Relating to Time is an important aspect of temporality in organizations. In addition, Relating to Time governs individuals’ perceptions of time and the passing of time as well as responses to time framing, time horizons and time pressure. In other words, Relating to Time concerns both Planning Time and Using Time. Relating to Time appears in many studies of time in organizations and is also referred to as construals (Ballard and Seibold, 2003), perceptions (Ancona et al., 2001), perspectives (Conte et al., 1995) and visions (Saunders et al., 2004) of time. As illustrated in Figure 4, Relating to Time consists of two key dimensions.

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1 One exception is Gersick’s (1994) powerful analysis of midpoint-transitions in group tasks, where it was found that the rate of acceleration increased as deadlines approached.
§3 Relating to Time

1. Planning schemata
   (a) Visualisation
   (b) Metaphor

2. Execution schemata
   (a) Temporal awareness
   (b) Temporal signification
   (c) Temporal preferences

Figure 4. Relating to Time (§3)

Planning schemata refer to the conceptualizations of time that are held by individuals in terms of planning time. From the perspective of this study, it is as important to have an understanding of how time is conceptualized during planning, as it is to have an understanding of how time is conceptualized from an experiential perspective. The rationale for this is that planning schemata are a key mechanism that can be used to optimize temporal performance in organizations (Yakura, 2002). To take an example from project management, the practice of specifying three-point estimates for tasks (best-case, worst-case and most likely) can be traced back to 1754 when Priestley suggested indicating date accuracy using spans rather than points in order to solve the problem of graphically representing temporal uncertainty. In Western societies, time has been primarily viewed in a linear manner (cf. Sarkar and Sahay, 2004). Indeed, the proposition that time could be visualized in a linear fashion with a uniform scale (i.e. all time intervals are considered equal) was first proposed by Barbeu-Dubourg in 1753 (Boyd Davis et al., 2010). More recently, individuals and organizations have begun to view temporal structures as cyclical or iterative phenomena (Ancona et al., 2001a). However, visualization techniques that support nonlinear views of time are only beginning to emerge (Boyd Davis et al., 2010). Thus, the implications of cyclical conceptualizations of time for planning are less well understood than the implications of linear configurations (Barley, 1986). Given the dominance of linear techniques for temporal visualization, the framework also suggests that metaphors about time that are employed within the organization during planning are taken into account.

Execution schemata (referred to in literature as temporal awareness) refer to one’s level of awareness of time as its passing is experienced. Previous studies have investigated several aspects of execution schemata but the main emphasis in existing literature is on the perceived speed at which time passes and on the meanings assigned to particular aspects of time. This literature has found that the perceived speed at which time passes is partly governed by the nature of the task. Time appears to “speed up” where activities are enjoyable. Indeed, a state of temporal dissociation may occur where activities are highly absorbing (Mainemelis, 2001). In these cases, the extent to which the passage of time is registered or perceived is reduced (cf. Agarwal and Karahanna, 2000). The literature on temporal signification (the meaning that is assigned to particular aspects of organizational temporality) demonstrates that individuals respond to particular temporal phenomena in different ways. It is well established, for example, that individuals’ responses to time pressure vary (Verplanken, 1993). For example, highly impulsive individuals respond more negatively to delays than their less impulsive counterparts (Wittmann and Paulus, 2007). These insights have led to the emergence of a growing body of research on temporal preferences. Temporal preferences have a formative role in shaping temporality in organizations because these preferences shape perceptions and experiences of time in firms.
Future Directions and Recommendations

This paper highlights the importance of temporality in firms and identifies a number of significant theoretical shortcomings that hinder our capacity to effectively reason about time. In particular, new opportunities to meaningfully evaluate organizational performance from a temporal perspective using Information Systems are being lost. The main purpose of the paper is therefore to leverage existing research on organizational temporality in order to fully specify the construct.

One of the main features of the framework that sets it apart from other studies is that it integrates the three main dimensions of temporality into a single framework: thinking about time, using time, and relating to time. This is a significant departure from existing studies which typically focus on only one of these dimensions (i.e. time use). In our view, this is an important contribution to research because Time is, at a fundamental level, a multidimensional and abstract construct that relates various constructs to each other and provides a holistic representation of a complex phenomenon. At the same time, the perspective taken in this paper is primarily a positivist one, but equally important contributions also await from an interpretive perspective. What is needed in such theorizing is recognition of the complementary, equal, and necessary perspective of interpretivism when it comes to a phenomenon such as time, whose individual and social dimensions cannot be separated from their phenomenological elements.

In terms of the implications of the research, we have identified some promising avenues for new research. Our intent is not to be exhaustive, but rather to present a number of possible paths that we believe have particular merit for future scholars. In terms of refining and validating the model, we feel that this framework should initially be enriched and enhanced by qualitative research designs, which are especially well suited to the study of dynamic phenomena (Simsek, 2009) and could therefore provide a firmer, more detailed theoretical understanding of organizational temporality. There is also a need to develop suitable measurement techniques for each of the components in the model. We believe that formative construct development techniques have strong potential in this regard because we feel that organizational temporality is a multidimensional and abstract construct best suited to formative measurement techniques. Finally, the utility of the framework could potentially be enhanced if researchers could devise a way of clearly conceptualizing the interactions between the components and subcomponents of the model visualizing how those interactions change over time.

In terms of utilizing the model, it provides a starting point for investigating the relationship between organizational temporality and other organizational constructs. We join Lee and Liebenau (2000), for example, in encouraging IS researchers to investigate the impact of IS/IT on organizational temporality. We also encourage researchers to use the model to begin to investigate the tensions that exist between the components of the model. For instance, we welcome future studies that evaluate the extent to which organizational temporal structures actually ‘fit’ the temporal preferences and perceptions of organizational actors. Similarly, we would like to see future research which investigates the friction that occurs when individuals with different temporal preferences work together and investigates the extent to which IS/IT reduces or exacerbates that friction. Further, there is a pressing need to develop the framework so that it can be used at multiple levels of analysis and can be used to investigate tensions across these levels. Finally, we encourage researchers to use this framework to meaningfully evaluate organizational performance from a temporal perspective. Given the unique opportunities afforded by IS/IT to monitor and trace time use in firms, we feel that IS researchers are in a particularly strong position to contribute to research in this area.

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